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CONVERGENCE OF AN ENTROPIC SEMI-DISCRETIZATION FOR NONLINEAR FOKKER-PLANCK EQUATIONS IN $\mathbb{R}^d$

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Abstract

A nonlinear degenerate Fokker-Planck equation in the whole space is analyzed. The existence of solutions to the corresponding implicit Euler scheme is proved, and it is shown that the semi-discrete solution converges to a solution of the continuous problem. Furthermore, the discrete entropy decays monotonically in time and the solution to the continuous problem is unique. The nonlinearity is assumed to be of porous-medium type. For the (given) potential, either a less than quadratic growth condition at infinity is supposed or the initial datum is assumed to be compactly supported. The existence proof is based on regularization and maximum principle arguments. Upper bounds for the tail behavior in space at infinity are also derived in the at-most-quadratic growth case.

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